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ABSTRACT

Data from the National Education Longitudinal Study of 1988 (NELS:88) were used to investigate whether there are differences between single-sex and coeducational Catholic secondary school students in academic and social psychological outcomes, whether any differences especially favor young women in single-sex Catholic secondary schools, and whether pre-enrollment differences between students account for any sector differences. In its base year, NELS:88 included approximately 25,000 randomly selected students in public and private schools. The analysis is based on students in Catholic schools with nonvocational emphasis. It is concluded that single-sex Catholic secondary schools are not especially advantageous academic settings, and that the few observed advantages of attending these schools benefit boys more than girls. Single-sex school boys appear to have higher achievement test scores in grades 10 and 12 than boys in coeducational schools, but they do not appear to learn more in that boys in both sectors increase their scores between grades 8 and 12 by about the same amount. It is also argued that sector differences in 10th- and 12th-grade student achievement test scores are due to pre-enrollment differences in measured background and prior achievement. (Contains 7 tables and 37 references.) (SLD)

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The Advantages of Single-Sex Catholic Secondary Schooling: Selection Effects, School Effects, or "Much Ado About Nothing?" *

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The Advantages of Single-Sex Catholic Secondary Schooling: Selection Effects, School Effects, or "Much Ado About Nothing?"

ABSTRACT

Using data from the National Education Longitudinal Study of 1988, we ask three questions. First, are there differences between single-sex and coeducational Catholic secondary school students in academic and social psychological outcomes? Second, do these differences especially favor young *women* in single-sex Catholic secondary schools? Third, can pre-enrollment differences between students account for these sector differences?

We conclude that single-sex Catholic secondary schools are *not* especially advantageous academic settings, and that the few observed advantages of attending these schools benefit *boys* more than *girls*. In the end, we argue that sector differences in 10th and 12th grade student achievement test scores are due to pre-enrollment differences in measured background and prior achievement.

INTRODUCTION

In this paper, we ask three questions: First, are there differences between single-sex and coeducational Catholic secondary school students in academic and social psychological outcomes? Second, do these differences especially favor young women in single-sex Catholic secondary schools? Third, can differences in students' pre-enrollment characteristics account for more favorable outcomes among single-sex Catholic school students? In general, we ask whether the benefits of single-sex Catholic secondary schooling as described by Bryk, Lee, and Holland (hereafter BL&H) in their 1993 book, *Catholic Schools and the Common Good*,[1] can be replicated using a more recent body of data. Then, we ask whether any apparent advantages of single-sex Catholic schooling can be attributed to selective patterns of enrollment, and not to single-sex Catholic schools' academic structure, communal school organization, or "inspirational ideologies" as BL&H suggest.

Although we limit our analyses to Catholic single-sex and coeducational secondary schooling, we believe that our analyses are more broadly relevant. In recent years, state and local initiatives to establish single-sex classrooms or schools in the *public* sector have had a measure of success. These initiatives are founded on the notion that single-sex schools, whether they are public or private, offer specific educational advantages. The results of our analyses should better inform the debate surrounding these proposed educational reforms.

A BRIEF HISTORY OF SINGLE-SEX SCHOOLING IN THE UNITED STATES

The Catholic Church has long regarded secondary school coeducation as a violation of the proper and appropriate separation of the sexes (Tyack and Hansot, 1990). The Sacred Congregation of the Affairs of Religious, mandated by Pope Pius XII in the 1950's to deal more thoroughly with the "difficult question" of mixed education of the sexes, reiterated the Church's long-standing policy against secondary school coeducation. In its 1957 *Instruction on Coeducation*, the Congregation concluded,

> False also and harmful to Christian education is the so-called method of 'coeducation.' This too, by many of its supporters, is founded upon naturalism and the denial of original sin; but by all, upon a deplorable confusion of ideas that mistakes a leveling promiscuity and equality, for the legitimate association of the sexes... (Frison, 1959, p. 18).

Despite the clarity and straightforwardness of the Congregation's *Instruction*, in practice an increasing proportion of Catholic schools in the United States (particularly new schools) during the 1960's and 1970's became coeducational. By 1983, only about one-quarter of Catholic high schools were girls' schools and about one-fifth were boys' schools, so that just under half of all Catholic schools were single-sex (Bryk, Lee, and Holland, 1993). This shift mirrored a general movement toward coeducation in other private school sectors and echoed a more global, cross-national trend away from curriculum differentiation by gender (Tyack and Hansot, 1990; Ramirez and Cha, 1990).[2]

In the Catholic sector, these changes can be attributed both to a softening of the Church's hard-line doctrine precipitated by the reforms of Vatican II and to more pragmatic and financial considerations (Tyack and Hansot, 1990; Bryk, Lee, and Holland, 1993). Quite simply, by the 1960's, many Catholic communities found it prohibitively

expensive to build separate high schools for boys and girls, or to support financially the daily operation of existing single-sex institutions (Bryk, Lee, and Holland, 1993).

In other (non-Catholic) private school sectors, the number of single-sex institutions has also dropped significantly at all levels. Between 1966 and 1986, the percentage of single-sex universities and colleges declined from 25 percent to 6 percent. In that twenty year period, the number of all-male colleges dropped from 236 to 99 and the number of all-female colleges dropped from 231 to 102. By 1980, just over 2 percent of all college women were attending single-sex institutions (Tyack and Hansot, 1990). At the secondary school level, declines in the numbers of (non-Catholic) private single-sex high schools have been equally pervasive. From 1963 to 1987, among the membership of the National Association of Independent Schools, the percentage of coeducational institutions increased from 38 percent to 76 percent, the proportion of boys' schools dropped from 37 percent to 11 percent, and the proportion of girls' schools dropped from 24 percent to 12 percent (Tyack and Hansot, 1990).

While single-sex schooling declined in the private sectors after World War II, coeducation had become nearly universal in public schooling by the late 19th century. By the beginning of the 1800's, most publicly funded, "common" grammar schools operated under a system of coeducation. By the end of the 19th century nearly all public secondary schools were coeducational as well. One can point to a variety of factors which contributed to the expansion of public high school coeducation (Kolesnik, 1969), but the development of coeducation as the normative course in public high schools also resulted largely for economic reasons. Similar to the movement away from single-sex Catholic schooling, witnessed a century later in the post-Vatican II reform era, public school districts in late 19th century simply found it too costly to fund separate schools for girls and boys. As Kolesnik (1969) argues,

> Coeducation at the high school level was not adopted as a consequence of any careful consideration of the inherent values such a system might have, and certainly not because of any research evidence pointing to its benefits. Nor was it introduced or accepted or defended, to any great extent, on the basis of any such principle as equality of the sexes. Rather, coeducation came into being rather unobtrusively as the more economical, and often only possible means of providing a more advanced education for the majority of American youth (p. 90).

ARGUMENTS FOR AND AGAINST COEDUCATION

Amid the decline of single-sex secondary schooling in the United States, researchers in the 1970's began to reexamine the educational benefits of single-sex schooling relative to coeducational schooling. The debate surrounding this issue has been revived of late as states and local communities have sought to implement single-sex schools or classrooms in the public sector. Although the evidence is mixed, proponents of single-sex Catholic secondary schooling argue that such schools provide specific advantages for students that can not be found in coeducational Catholic school settings. Indeed, as BL&H and others have concluded, students in single-sex secondary Catholic schools take more academically oriented courses, score higher on standardized achievement tests, and have higher educational aspirations. On the other hand, advocates of coeducational schooling have cast doubt on the differential effectiveness of single-sex and coeducational schooling, arguing that single-sex schools are no more advantageous, either academically or socially, than coeducational schools (Dale and Miller, 1972; Dale

1974; Willis and Kenway, 1986; Marsh, 1989; Marsh, Owens, Myers, and Smith, 1989; Marsh 1991).

If we grant for the moment that students who attend single-sex Catholic secondary schools enjoy more favorable educational and social outcomes relative to coeducational Catholic secondary school students, then we are led to ask, "Why might single-sex Catholic secondary schools be especially advantageous educational settings?" In the next section of this paper we review the evidence for the differential effectiveness of single-sex Catholic secondary schooling and present three prominent explanations for the apparent advantages of single-sex schooling. After reviewing these explanations, we formulate a series of hypotheses that are implied by the literature and that we test empirically in our subsequent analyses.

Youth Culture and School Climate

Since the 1960's, many observers have claimed that coeducational school settings are oriented toward a "youth culture" in which social and/or romantic considerations preclude the optimal intellectual development of students (Coleman, 1961; Goodlad, 1984; Riordan, 1985). As a result, in single-sex schools, students are better able to concentrate on academic matters. As Coleman (1961) notes,

> Coeducation in some high schools may be inimical to *both* academic achievement *and* social adjustment. The dichotomy often forced between "life-adjustment" and "academic emphasis" is a false one, for it forgets that most of the teen-ager's energy is not directed toward either of these goals. [illegible] and the cruel jungle of rating and

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> dating versus school activities, whether of the academic or life-adjustment variety (Coleman, 1961, p. 51, emphasis original).

Similarly, in arguing for the efficacy of single-sex schools, Riordan (1985) suggests that Catholic single-sex schools operate with a "reduced adolescent subculture," providing fewer nonacademic distractions, fewer problems of control and discipline, and a greater display of same-sex academic role models. He goes on to argue that "Catholic single-sex schools are nearly twice as effective as Catholic mixed-sex schools" (p. 536), and adds that his results "suggest the need to halt temporarily the closing of single-sex schools" (p. 518).

Not all studies, however, have come to this conclusion. For example, in Dale's voluminous (and opinionated) research, he argues that coeducational grammar schools are happier social environments, that anxiety and neuroticism are lower among students and teachers in coeducational settings, and that these social and affective advantages of coeducational over single-sex schools do not come at the expense of academic progress (e.g., Dale, 1974).

Gender Bias in Coeducational Settings

Other researchers claim that gender discrimination is so pervasive in coeducational school settings that the complete separation of girls from boys is essential (Shaw, 1980; Howe, 1984; Mahony, 1985). As a result, the apparent advantages of single-sex secondary schools, especially for girls, may be attributable to the absence of gender discrimination and bias in these settings. As numerous studies have demonstrated, despite [illegible] boys tend

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to dominate classroom discussion, interrupt girls more often, and are more frequently rewarded for active thinking; girls are under-represented in math and science classes; history textbooks tend to distort, trivialize, or ignore the roles of women; boys and girls both tend to believe that teachers have higher expectations for boys; girls are more often "picked-on" by boys and are more frequently the subjects of jokes and sexual innuendo; teacher training shows little awareness or acknowledgment of the ways in which teachers and schools perpetuate sex bias; and despite the fact that two-third of all teachers are women, the overwhelming majority of administrators are male (for reviews see Tyack and Hansot, 1990; Mahoney, 1985; Shaw, 1980; Jones, 1990; Bauch, 1988; Howe, 1984).

Underscoring the critical approach that the "New Feminists" of the 1970's brought to the study of coeducation, Florence Howe explains the connection between society and coeducational schooling:

> Coeducation - in elementary schools or in colleges - functions within the larger patriarchal limits of the society in which it exists. In mythic terms, coeducation opened doors to women. And so it did. But those doors were - and to a significant extent still are - different from those open to men (1984, p. 209).

As Tyack and Hansot note, "For some, it was only a small step from criticizing coeducational schools to advocating single-sex girls' schools" (pp. 284-285). Shaw (1980), for example, argues that returning to single-sex schools for girls (schools run by women for women), far from being politically reactionary or regressive, would provide a form of affirmative action for girls in a sexist society, offer parents and families a choice of

curricular program, and produce a model of educational excellence that might be adopted more widely.

Following from this philosophical stance, recent observers have argued that single-sex schools are more effective learning environments, especially for young women (Riordan 1985). Bauch (1988) writes that "students in single-sex schools consistently outperform students in mixed-sex schools in mathematics, science and reading ability" (p. 56), and Lee and Marks (1990) find that in the United States "the single-sex experience appears to be somewhat more empowering for young women than for young men" (p. 589). In the end, Bauch (1988) echoes a common sentiment among these observers when she argues that it is "important to continue to provide the option of single-sex schooling and to create such options where they do not already exist" (p. 57).

However, not all feminist critiques of coeducational schooling see the shift to single-sex education as the logical reaction to gender inequities. Jones (1990), for example, asserts that creating single-sex schools is an overly simplistic solution. She argues that policies and practices need to be devised, at all levels of the educational system, to persuade male administrators, teachers, guidance counselors, and students that the problem of sexism exists and must be faced. As Willis and Kenway (1986) add, "the strategy of single-sex schooling [whether in the form of single-sex schools or single-sex classes within schools] is limited because it focuses exclusively on changing the attitude and behavior of girls and shows little potential for changing teachers, the curriculum or boys" (p. 132).

Pre-Enrollment Differences in Student Characteristics

Some researchers (e.g. Dale, 1974; Willis and Kenway, 1986; Marsh, 1991; Marsh, et al., 1989) have argued that single-sex schools have more rigorous and demanding entry standards and are attended by pupils who are more intelligent, more highly motivated, and have more favorable class and family backgrounds. As a result, these observers attribute the apparent advantages of single-sex secondary schools to the selectivity of these schools, and not to any differential educational effectiveness.[3] In a review of studies of single-sex schools in Great Britain and Australia, Willis and Kenway (1986) note that researchers are often too eager to attribute differences in academic ability between girls in single-sex and coeducational schools to "school effects." As the authors argue,

> In both the United Kingdom and Australia, it is suggested girls in single-sex schools achieve greater academic success than do girls in coeducational schools. This is interpreted as establishing that single-sex schooling produces these results. Such arguments show a failure to understand (or a refusal to acknowledge) that, in both Britain and Australia, single-sex schools are most often private schools, selective on the basis of ability and/or income (and consequently social class) (Willis and Kenway, 1986, p. 135).

Echoing this sentiment, Marsh (1991) notes that studies which compare single-sex and coeducational schools are hampered by the nonequivalent group comparisons used in most research designs. The presence of preexisting variables, he argues, invalidates the interpretation of sector comparisons particularly for those studies that do not take into account such biases. However, Marsh (1991) adds that even those studies that do attempt

to correct preexisting influences must be interpreted cautiously because of the difficulties inherent in using statistical procedures to equate nonequivalent samples.

BRYK, LEE, AND HOLLAND (1993)

In their analyses, BL&H examine single-sex and coeducational Catholic secondary schools in the High School and Beyond (HS&B) sample and present analyses that they claim demonstrate "a broad base of positive effects for single-sex schools across a diverse array of educational outcomes" (1993, p. 239). After holding constant students' social backgrounds, academic curriculum tracks, and school social contexts, the authors make the following conclusions regarding academic achievement:[4] compared to their counterparts in coeducational Catholic schools, 1) students in boys' Catholic schools score higher on reading, mathematics, and writing achievement tests in their sophomore years; 2) students in boys' Catholic schools score higher on mathematics achievement tests in their senior years; 3) students in girls' Catholic schools score higher on reading achievement tests in their senior years; and 4) between their sophomore and senior years, students in girls' Catholic schools enjoy larger increases in their reading and science achievement test scores.[5] BL&H argue that these reported differences "appear very substantial" (1993, p. 236), that "something positive is occurring in single-sex Catholic high schools" (1993, p. 239), and that "public policy should focus on finding ways to preserve existing single-sex schools and to encourage their development in other contexts where the option does not currently exist" (1993, p. 241).

The validity of BL&H's assertion that single-sex Catholic secondary schools are more effective than Catholic coeducational secondary schools depends heavily on their ability to consider preexisting (pre-enrollment) differences between coeducational and

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single-sex Catholic school students that might also account for the observed sector differences in educational outcomes (Jones, 1990; Lee and Lockheed, 1990; Willis and Kenway, 1986). To their credit, BL&H are aware of this methodological issue:[6] the authors note that in response to their concern over selectivity issues, they have introduced into their analyses statistical adjustments for other factors (listed above) that may also influence achievement test scores. Furthermore, in much of their research the authors analyze gain scores (the differences between sophomore and senior year test scores) to account for the fact that single-sex school students have higher mean sophomore year test scores. In the end, they argue that their adjustments yield a sample of schools and students that "presents a nearly ideal natural experiment" (1986, p. 383).

We wonder, however, whether the adjustments for 10th grade student characteristics and school social context or the utilization of sophomore to senior year gain scores adequately addresses pre-enrollment differences between single-sex and coeducational school students. If, at the time they enter high school (typically the end of 8th grade), students who eventually attend single-sex and coeducational schools differ substantially in terms of course taking histories, academic achievement, school social context, or any other factors that may influence later achievement outcomes, then the failure to control for these factors will bias the estimates of sector differences in educational effectiveness. In short, even though they controlled for differences between students as measured in Grade 10, since BL&H were not able to consider carefully pre-enrollment differences between students who eventually attended single-sex and coeducational schools, they may not have accurately measured the independent effect of single-sex school enrollment on student outcomes.

ANALYSIS PLAN

To summarize, the literature on single-sex schooling is divided about whether such schools are more effective than coeducational schools. Proponents of coeducation argue that there are no unique educational advantages to single-sex schooling, and that previous analyses which purport to show otherwise have failed to consider that pre-enrollment differences between students might account for any observed differences in outcomes. On the other hand, proponents of single-sex schooling argue that the "youth culture" and gender biases which permeate coeducational school settings make them potentially inferior educational environments, and as a result, students in coeducational Catholic secondary school settings learn less and have less favorable social psychological outcomes. In our analyses, we test three hypotheses that are designed to address these issues.

> Hypothesis #1: Boys and girls who attend single-sex Catholic secondary schools score higher on tests of academic achievement and self-concept than students who attend coeducational Catholic secondary schools.
>
> Hypothesis #2: Any advantages associated with enrollment in single-sex Catholic secondary schools are especially powerful for *female* students.
>
> Hypothesis #3: Any advantages associated with enrollment in single-sex Catholic secondary schools can be explained by *pre-enrollment differences* between students who attend single-sex and coeducational institutions.

The first hypothesis simply tests the assertion that single-sex Catholic secondary schools are more effective learning environments than coeducational schools. Do single-sex Catholic school students have more favorable outcomes than students in coeducational Catholic schools? This question has been the essential focus of debate for most of the

research in this area. Also, if it is true that the "reduced adolescent subculture" found in single-sex settings has specific educational advantages, then we should find support for the first hypothesis. The second hypothesis asks whether the first hypothesis is especially true for female students. That is, if gender biases in coeducational settings impair girls' academic and emotional development, then we would expect girls in single-sex schools to score higher on achievement tests and tests of psychological well-being than their counterparts in coeducational schools. The third hypothesis addresses the argument that observed differences between students who attend single-sex and coeducational schools are due to prior differences between students, and not to anything that happens within single-sex schools.

OVERVIEW OF THE NATIONAL EDUCATION LONGITUDINAL STUDY OF 1988 (NELS:88)

NELS:88 is a longitudinal survey of the eighth grade student cohort of 1988. In the base year, the sample included approximately 25,000 randomly selected students in 1,000 public and private schools across the United States. In addition to the data collected from student interviews, NELS:88 contains information from parents, school administrators, and teachers. Since the basic unit of analysis is the student, information from these other sources can be thought of as providing contextual data. The initial student cohort has been followed-up on three occasions, in 1990, 1992, and 1994. Students who dropped out of school between survey waves were also interviewed, and for each follow-up the sample was "freshened" with new sample members in order to make the first and second follow-ups cross-sectionally representative of 1990 sophomores and 1992 seniors, respectively.

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NELS:88 contains a vast amount of information about students and their classmates, families, and schools. Students' grades, course work, educational aspirations and attitudes, family backgrounds, and other academically relevant considerations are described in great detail. Information about the type of schools students attended (single-sex versus coeducational; private versus public; Catholic private versus other private; etc.), the organization of those schools, and characteristics of other students enrolled in those schools is available and can be linked to individual students' characteristics and outcomes. In addition, and importantly for our purposes, social psychological tests and achievement tests in reading comprehension, mathematics, science, and social studies were administered to students in each wave of the study.[7]

The NELS:88 data are not only suitable for answering the questions we seek to ask, but they are also better than other available data in two important respects. First, like HS&B, the sample is large enough that it contains a sufficient number of students in Catholic single-sex and coeducational secondary schools for relatively sophisticated analyses which compare these sectors of schools. Second, and most significantly, the design of the survey is such that students are initially observed *before* they enter high school. Most recent analyses, including those by BL&H, utilize data from the HS&B study that initially observed students at grade 10, *after* they entered high school. When students are initially observed at grade 10 they have already spent at least one year in either a single-sex or a coeducational Catholic secondary school. Analysts who control for "initial" differences between students as measured at grade 10 are not, in fact, controlling for initial differences between students at the time that they enter high school. Since NELS:88 initially observes students at grade 8, we are much better able to control for pre-enrollment differences before assessing the relative effectiveness of different school sectors.

DEFINITION OF ANALYSIS SAMPLE

For analyses of 10th grade student outcomes, we selected cases in which students were: 1) enrolled in either Catholic single-sex or Catholic coeducational secondary schools in 10th grade; 2) attending schools which reported that fewer than 25 percent of their students were in a vocational curricular program; and 3) in-school and in-grade in 1990 (their sophomore years). We excluded students who were attending more vocationally-oriented schools to make our analyses consistent with those of BL&H. As Lee and Bryk (1986, p. 383) note, these schools generally specialize in stenographic and clerical training and are "atypical of the Catholic sector as a whole, which emphasizes a traditional academic program" (see also Bryk, Holland, Lee, and Carriedo 1984). In our opinion, this restriction is unjustified and probably biases the analyses (both ours and theirs) in favor of finding advantages of single-sex secondary schooling. As we will discuss, however, at many points in our analyses we have made decisions which make it *more* likely that we will find such effects.

For analyses of 12th grade student outcomes, we further restricted our sample to cases in which students: 4) responded to the first three survey waves; 5) did not drop out between grades 10 and 12; and 6) did not change schools between grades 10 and 12. These sample limitations ensure that we are comparing students who have spent equivalent amounts of time in their respective school sectors. The final restriction, for example, is necessary so that we can be sure that students classified as attending a Catholic school in grade 10 were still attending the same Catholic school in grade 12.

Table 1 describes the effects of each of these restrictions on the number of cases retained in the final analysis sample. In all, more than 80 percent of potential male and

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female students in each sector were retained, with one exception: only 67 percent of single-sex Catholic school girls are retained in the final analysis sample, primarily because of the restriction on predominantly vocational Catholic schools discussed above.

In order to approximate population characteristics and to account for panel attrition over time, users of the NELS:88 data must weight their sample by one of the many weights provided by National Center for Education Statistics in the NELS:88 data file (U.S. Department of Education, 1990). As Table 1 shows, we use a different weight for different stages of our analysis. When we consider only 10th grade student characteristics, for example, we weight the data using the variable F1QWT, but when we consider 10th *and* 12th grade student characteristics, we weight the data using F2F1PNWT. In all, we use four different weights at different points in our analyses.

In order to adjust our weights in such a way as to have standard errors reflect actual sample sizes (as opposed to the size of the reference population), we divided each weight by its mean before weighting. Also, because NELS:88 employed a cluster sampling design, and because commonly available statistical software packages assume that data were collected through simple random sampling, we also adjusted each weight in such a way as to correct for design effects. Specifically, after dividing each weight by its mean, we further divided them by DEFF, the mean (Catholic school-specific) design effect across variables in the survey wave or waves in question (U. S. Department of Education, 1990).[8] The bottom half of Table 1 lists the final weighted sample sizes for male and female students in each school sector and in each analysis sample.

STUDENT BACKGROUND DIFFERENCES

Tables 2 and 3 describe the characteristics of male and female students in each school sector in grades 8 and 10, respectively.[9] For the purposes of our descriptive analyses, we have weighted the data by F2PNLWT, which is designed for analyses which use student-level data from all three survey waves. Due to item non-response, the sample sizes vary from item to item, but the maximum weighted sample sizes are presented in each table.

The first panels of Tables 2 and 3 show clearly that students who attend single-sex Catholic schools come from families which are more advantaged than those of their coeducational Catholic school counterparts. In both grade 8 and grade 10, the differences in SES[10] between single-sex and coeducational Catholic school students are considerable, but we should note that these differences never approach the magnitude of the difference between Catholic and public comprehensive school students (results not shown). In accordance with these findings, Tables 2 and 3 also show that students in single-sex Catholic secondary schools tend to have fewer siblings than students in coeducational Catholic secondary schools; however, students in each school are equally likely to live in two-parent households. Finally, these results indicate that Catholic single-sex and Catholic coeducational schools enroll roughly equal proportions of white and nonwhite pupils. In addition, in separate analyses (not shown), we have found that both Catholic sectors enroll roughly the same proportions of white and non-white students as public comprehensive schools. This finding is consistent with recent analyses which have shown tremendous increases in the numbers of non-white students enrolled in Catholic schools (Brigham, 1993).

We used three items from the NELS:88 data to assess students' educational aspirations. Each item is included in all three survey waves. The three items asked students how likely they thought it was that they would graduate from high school,

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continue their educations beyond high school, and finish college. It is not clear from Tables 2 or 3 that single-sex Catholic school students have higher educational aspirations than coeducational Catholic school students, especially in the case of female students. Indeed in grade 8, female students who attended Catholic coeducational high schools held *higher* educational aspirations, however measured, than girls who attended single-sex Catholic high schools.

Table 3 also reports the percentage of students in each type of school who have ever repeated a grade.[11] We find little difference between single-sex and coeducational school girls in this regard, but among boys there is a considerable difference between single-sex and coeducational school pupils. Boys in single-sex Catholic high schools are much less likely than coeducational high school boys to have ever repeated a grade.

We should note here that although we have criticized BL&H and others for not considering student characteristics before grade 10, the results of Table 2 (that reports student characteristics in grade 8) do not tell us how important selection effects may be in accounting for observed sector differences in student outcomes. It may be that those students who are advantaged in grade 10 are precisely the same students who are advantaged in grade 8, and that the measured background and aspiration variables change very little between those two grades. If this is the case, then controlling for family background and educational aspirations as measured in grade 10 effectively controls for pre-enrollment differences in student characteristics. In any case, none of the above findings is surprising. Finally, it is worth reiterating that the differences between single-sex and coeducational Catholic school students are generally very small in comparison to the differences between Catholic and public school students (which are not shown here).

DIFFERENCES IN STUDENT OUTCOMES

Although BL&H consider a broad array of student outcomes, we have decided to consider only achievement tests and social psychological measures. We examine achievement test scores because we feel that it is intrinsically interesting to study the factors that foster learning in schools. Our interest in social psychological measures stems from our desire to explore the possibility that single-sex schools are more effective, especially for girls, because of the absence of gender-based competition and discrimination that exists in coeducational schools. In short, if girls in single-sex Catholic schools are empowered through their separation from boys, we would expect girls to score higher on locus of control and self-esteem tests when they attend these schools.

Table 4 reports the weighted means and standard errors[12] for reading, mathematics, science, and social studies achievement test scores for girls and boys in each school sector as measured in grade 8, grade 10, and grade 12. In addition, the table reports the average change in these scores between grades 8 and 12 for students in each school type; these are generally referred to as "gain scores." As in Table 3, the data are weighted by F2PNLWT and the sample sizes for individual items vary due to item nonresponse. For each result, and separately for boys and girls, we follow BL&H in reporting the statistical significance of the differences between single-sex and coeducational school students using *one*-tailed tests. In our view the use of less conservative one-tailed tests makes it *more* likely that we will find sector differences. In keeping with our strategy of making methodological decisions that tend to favor findings of sector effects, we choose them over two-tailed tests.

In accordance with previous findings, Table 4 shows that boys who attend single-sex Catholic high schools have higher achievement test scores than boys enrolled in

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coeducational Catholic high schools. This is true for all four tests in each of three observed school years. However, the differences in science and social studies test scores are not statistically significant in grade 12. Surprisingly, though, we find that girls in single-sex Catholic schools have *lower* achievement test scores than girls in coeducational Catholic schools, with one exception (the 10th grade social studies test). While for girls the sector differences in test scores are never statistically significant, they are in sharp contrast to the findings of BL&H and others.

Table 4 also shows that there are no significant differences in gain scores between single-sex and coeducational high school pupils. Although single-sex school boys appear to *know* more than coeducational school boys in each grade, single-sex school boys and girls do not *learn* more than coeducational school boys and girls during the high school years. In addition, careful examination of Table 4 reveals that students in each sector appear to learn more between grades 8 and 10 than between grades 10 and 12. That is, in almost every case, most of the "gains" in the gain scores occur in the first two years of high school. This fact underscores the need to use data that contain pre-enrollment information about students.

Table 5 reports students' scores on scales which assess locus of control and self-esteem in grades 8, 10, and 12. These scores are standardized across the entire NELS:88 sample with a mean of zero and a standard deviation of one. In each case, boys in single-sex Catholic schools have higher scores on these tests than boys in coeducational Catholic schools, and girls in coeducational Catholic schools have higher scores than girls in single-sex Catholic schools. However, these differences are never statistically significant. Again, like the findings for achievement test scores, our results for girls are in sharp contrast to those of previous analysts. Finally, we see no significant or interesting

sector differences in gain scores on these tests. It appears that changes in locus of control and self-esteem differ little between school sectors.

MULTIVARIATE REGRESSIONS

In the preceding section we observed that boys who attend single-sex Catholic schools generally score higher than boys who attend Catholic coeducational schools on academic achievement and self-concept tests; we observed no such effects for girls. Next, we consider whether observed differences (or the lack thereof) between these sectors on student outcomes are related to sector difference in student characteristics (observed in Tables 2 and 3).

In Table 6 we attempt to roughly replicate BL&H's findings using the NELS:88 data. That is, we consider only 10th and 12th grade student characteristics in predicting 10th and 12th grade student outcomes. First, looking at 10th grade outcomes, Model A in Table 6 reports the unstandardized coefficients for a dummy variable which indicates whether or not a pupil attended a single-sex high school in models which include no other independent variables. As expected (based on the information in Table 4), boys achievement test scores are positively associated with single-sex school enrollment.[13] Next, in Model B, we add terms for students' family backgrounds (SES, number of siblings, intact household, race, and grade delay) and educational aspirations as measured in grade 10. We have controlled for fewer student characteristics than BL&H, and we have controlled for no "school social context" variables as they do. The omission of these control variables is likely to bias our findings in *favor* of finding significant single-sex school effects. Indeed, we find that enrollment in a single-sex Catholic school has a statistically significant and positive effect on boys' mathematics, science, and social studies

test scores in grade 10. Unexpectedly, we also find that single-sex school enrollment has a statistically significant and *negative* effect on girls' locus of control.

Model C considers the effect of single-sex school attendance on 12th grade student outcomes. Again, as expected, we find a positive association between sector and boys' reading and mathematics scores. Next, in Model D, we add terms for students' family background and educational aspirations as assessed in grade 10. We see here that the inclusion of these terms has relatively little impact on the magnitude or statistical significance of the coefficients which were significant and positive in Model C. Finally, in Model D we add terms for students' achievement and self-esteem test scores as measured in grade 10. In their corresponding models of 10th to 12th grade gain scores, BL&H only include terms for the 10th grade test score which corresponds to the 12th grade outcome. That is, in their model which predicts 12th grade reading gains, they include the 10th grade reading test score as an independent variable, but not the mathematics, science, or social studies test scores. This suggests that ability in one realm has no effect on ability in another realm; we see no reason to suppose that this is true. In any case, after including the 10th grade achievement test scores, we find no significant effects of single-sex school attendance on any 12th grade outcome, either for boys or girls.

Models F through H in Table 6 are the same as models C through E, except that the dependent variables are 10th to 12th grade gain scores. Since we saw in Table 4 that students in single-sex schools do not learn more than their coeducational school counterparts, it is not surprising that the single-sex school dummy variable has no effects on gain scores in these models. Note that Model E and Model H are identical; since we include 10th grade test scores as independent variables in these models, the choice of gain scores over raw 12th grade scores is inconsequential.

In short, we have only partially replicated BL&H's findings, even though we made fewer adjustments for student and school characteristics. We found, like BL&H, that boys' 10th grade test scores are positively affected by enrollment in a single-sex Catholic school, even after controlling for family background and educational aspirations as measured in grade 10. However, we found no such effects for girls' 10th grade outcomes or for boys' or girls' 12th grade outcomes.

In Table 7 we present a series of regressions of 10th and 12th grade student outcomes on students' family backgrounds and test scores as measured in grade 8 and grade 10. Considering 10th grade outcomes first, Model A includes only the single-sex school dummy variable. Note that the findings from this model are not entirely comparable to Model A in Table 6 because we delete cases listwise in each series of models, because we use different sample weights, and because the subsequent models in each table use different independent variables. In any case, and as expected, Model A of Table 7 shows that boys (but not girls) in single-sex Catholic schools have higher achievement test scores. Models B and C add terms for family background, educational aspirations, and prior achievement, each measured in grade 8. By controlling for pre-enrollment differences between students, as opposed to differences between them at grade 10, we hope to get a better picture of the impact of enrollment in single-sex Catholic secondary schools. As Models B and C in Table 7 show, after controlling for these 8th grade student characteristics, there are no positive and statistically significant effects of attending single-sex schools. Indeed, the only statistically significant effect is *negative*: boys in single-sex schools do *worse* on 10th grade reading tests than boys in coeducational schools.

The next series of models in Table 7 examine 12th grade student outcomes. In succession, we add to the baseline model terms for students' family background,

educational aspirations, and achievement and self-concept test scores as measured in grades 8 and 10. As model F shows, after controlling for 8th grade student characteristics, there are no statistically significant effects of attending a single-sex Catholic school. In a sense, these models are unnecessary. In Table 6 we saw no positive relationships between single-sex school attendance and 12th grade student outcomes after controlling for 10th grade student characteristics. The models in Table 7 do an even better job of controlling for pre-enrollment differences between students, and so our failure to find single-sex school effects is hardly surprising.

DISCUSSION

We hasten to point out that at a number of places in our analyses we have made decisions which would tend to bias our findings *toward* concluding that single-sex schools are especially advantageous educational environments. Some might say that we have "stacked the deck" in favor of replicating the findings of BL&H and others. Were we starting from scratch, we would not have thrown out students who attended vocationally-oriented Catholic schools; we would have used more stringent (two-tailed) tests of statistical significance in our descriptive analyses; we would have included a broader array of control variables in our regression analyses; and we probably would have argued that design-effect adjusted standard errors are more appropriate, even in regression analyses. Nonetheless, our failure to find advantages of attending a single-sex secondary school are all the more credible for our having eschewed these more conservative methodological routes.

To conclude, we return to the three hypotheses outlined earlier. First, do boys and girls who attend single-sex Catholic secondary schools have higher achievement and

self-concept test scores than students who attend coeducational Catholic secondary schools? Single-sex school boys appear to have higher achievement test scores in grades 10 and 12 than boys in coeducational schools, but they do not appear to learn more. The strongest evidence for this is the finding that boys in both sectors increase their scores between grades 8 and 12 by about the same amount. That is, across the high school years, boys in single-sex schools do not increase their test scores any more than boys in coeducational schools. For girls, the first hypothesis is clearly rejected: Nowhere did we find statistically significant positive effects of single-sex school enrollment for girls.

In short, we cannot conclude that single-sex Catholic schools are especially advantageous academic settings, at least relative to coeducational Catholic schools. It is clear that single-sex Catholic school boys in grades 10 and 12 *know* more than coeducational Catholic school boys, but they already knew more in grade 8. We simply find no evidence that single-sex Catholic school boys or girls *learn* more than their coeducational Catholic school peers during the high school years.

Why might our results differ so markedly from those of BL&H and others? One possibility is that something important about Catholic schools has changed since 1980, when the HS&B data were initially collected. One area in which Catholic schools have clearly changed concerns the demographic characteristics of their students. Throughout the 1980's, an interesting trend in Catholic school enrollment occurred in the United States. While the number of students attending Catholic secondary schools declined from 796,000 in 1982 to 584,000 in 1992 (a 27 percent enrollment decrease), and the overall numbers of Catholic high schools dropped from 1,482 schools to 1,249 schools, the percentage of non-white pupils enrolled in Catholic schools increased from 16.3 percent in 1982 to 23.2 percent in 1992 and the percentage of non-Catholics enrolled in Catholic high schools increased from 11.2 percent in 1982 to 15.3 percent in 1992 (Brigham,

1993). Our data echo these changes and underscore a significant difference between our sample of Catholic high school students and the HS&B sample used by BL&H. It is clear from a cursory comparison of our sample and of BL&H's that students, on a wide range of demographic variables, are different. Further, given that one of our central arguments is that it is important for researchers comparing the effectiveness of single-sex and coeducational schooling to take into account pre-existing differences among students, these demographic changes warrant close scrutiny. In the analyses and discussion we present in this paper, we have not addressed how these demographic changes might affect the relative advantages and disadvantages of single-sex and coeducational schooling, and are reluctant to offer uniformed conjectures. We do, however, believe that it is important to note these differences and to point to the need for further study.

Second, are the advantages associated with enrollment in a single-sex Catholic secondary school especially powerful for female high school students? Our findings suggest that the opposite is true. As mentioned above, boys in single-sex Catholic schools have higher achievement test scores than boys in coeducational Catholic scores (although we hesitate to attribute these differences to attending single-sex schools, because these boys already differ in grade 8). Girls, on the other hand, do at least as well in coeducational settings, and generally better (although the differences are seldom statistically significant). In sum, if there are any gender differences in the effect of single-sex school attendance, they favor boys, not girls.

How can we reconcile this finding with those of previous studies which purport to show "strong" and "pervasive" effects of single-sex Catholic secondary schools on girls' achievements and self-esteem? Again, we wonder whether Catholic schools have changed in important ways since the early 1980's. A cursory search through a bibliographic data base shows that from the time the HS&B data were collected in the early 1980's until

today, hundreds of books and journal articles[14] have been published which highlight sexism and gender bias in our nation's schools. In terms of educational policy, calls for a radical overhaul of the sexist socialization practices embedded in schools and in classrooms and a sharpened focus on schools as "primary sites for sexist socialization" (Lee, Marks, and Byrd, 1994, p. 92; see also, American Association of University Women, 1990; Orenstein, 1994) have been equally evident. Gender discrimination is no longer simply the bailiwick of Feminist scholars, but has reached the forefront of debate in educational reform movements. The implementation of gender equity measures such as Title IX not only underscores the importance of this issue, but helps to propel much needed changes in classrooms and in schools. However, before we become overly optimistic about the pace and scope of these reform efforts, one thing that research in this area has demonstrated is that gender discrimination is a far more subtle and complex problem than is implied by past research. More to the point, what the limited amount of cross-sector research that has been done in this area (e.g. Lee, Marks, and Byrd, 1994) suggests is that incidences of sexism occur in all school sectors regardless of gender composition.[15]

It would be naive to suggest that schools have not responded to the recent focus on gender bias in schools and classrooms. If coeducational schools have "cleaned up their acts" to an important extent since the early 1980's, then the advantages for girls of attending single-sex secondary schools may have declined. In any case, those advantages for girls are not evident in our data.

Third, are the advantages associated with enrollment in a single-sex Catholic secondary school due to pre-enrollment differences in the characteristics of students who attend single-sex and coeducational institutions? Since we observe so few advantages of single-sex Catholic schooling, it is hard to answer this question. We initially expected to

find that single-sex Catholic school students had higher test scores than their coeducational Catholic school peers, and that we might explain this by controlling for pre-enrollment characteristics. In the end, we can only say that it is true that boys who attend single-sex Catholic secondary schools have higher test scores than coeducational Catholic school boys in grade 8. Whether this fact could account for the findings reached by BL&H and others, who did not consider pre-enrollment characteristics, remains to be seen.

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NOTES

[1] Chapter 9 of this book focuses on single-sex Catholic secondary schooling, and is a revision of a 1986 article in the *Journal of Educational Psychology* by Lee and Bryk. Since the two works are essentially the same, we refer to both when we mention "BL&H." In focusing on their research, we do not wish to suggest that there is anything extraordinary about BL&H's analyses that cause us to question them specifically. Their work is merely the most recent in a series of analyses that purport to demonstrate advantages of single-sex secondary schooling.

[2] As Tyack and Hansot (1990) note, during the 1980's coeducation had also become increasingly prevalent in European religious schools. In Great Britain, where there is a long tradition of single-sex schools for upper and middle class families, educators deliberately imitated the American model of coeducational and socially comprehensive schools in an attempt to remedy inequalities in schooling based not only on gender but also on class.

[3] The issue of selectivity in regard to Catholic schooling reached the forefront of debate following the publication of two controversial books in 1982 (Coleman, Hoffer, and Kilgore, 1982; Greeley, 1982). Advocating that Catholic schools produce higher cognitive achievement and are less racially segregated than public schools, both Coleman et al. and Greeley suggest that achievement in Catholic high schools is less dependent on family background and personal circumstances than in public sectors. Commentators widely criticized both studies, primarily for their methodological shortcomings, and initiated a lively debate (see, for example, *Sociology of Education* vol .55 in 1982; *Sociology of Education*, vol. 58 in 1985; and *Harvard Educational Review*, vol. 51, in 1985).

[4] BL&H also focus on differences between single-sex and coeducational Catholic school students in school-related attitudes and behaviors, course enrollments, educational aspirations, and sex-role attitudes. We focus primarily on academic achievement, locus of control, and self-concept as outcomes, but consider other issues as necessary.

[5] We should note that BL&H never report standard errors or other measures of variability in their outcome measures. As a result, we can never tell whether their observed sector differences are ever statistically significant

[6] In fact, in recent work by Lee and her colleagues, the authors address the methodological problems associated with the issue of selectivity (e.g. Lee and Marks, 1990; Lee and Marks, 1992; Lee and Bryk, 1986) and readily admit that "no aspect of independent schools provokes more interest and controversy than does selectivity .... Admissions criteria, which vary widely, include considerably more than test data. Students and families also generally exercise self-selection, based on a school's reputation" (Lee and Marks, 1992, pp. 233-234). Moreover, Lee and her colleagues are vocal critics of previous studies which typically involved small, non-random samples, and as they have argued, "... researchers generally have not adjusted for differences in the background characteristics of students attending coeducational versus single-sex schools and often have not considered whether the effects might be different for boys and girls" (Lee and Bryk, 1986, p. 382). But as Marsh (1989) skillfully demonstrates in his review of their study, despite rhetoric to the contrary, HS&B does not contain, nor do BL&H provide, adequate controls "... for possible preexisting differences in academic achievement, prior course work, self-concept, locus of control or other school-related behaviors and attitudes that were considered as outcomes" (1989, p. 72).

[7] As measures of self-esteem and locus of control, we use a 7-item self-esteem scale adapted f[illegible]n inventory and a 6-item locus of control scale

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adapted from Rotter's locus of control measure (for a discussion of the general reliability and validity of these instruments see Rosenberg, 1986; Rosenberg, 1989; Rotter, 1966). For tests of reading, mathematics, science, and social studies, we use the IRT (Item Response Theory) composites developed in each wave of the NELS:88 survey. Rock and Pollack (1990) provide a detailed psychometric report for the base year test battery. In addition, two recent studies (Kupermintz, Ennis, Hamilton, Talbert, and Snow, 1995; Hamilton, Nussbaum, Kupermintz, Kerkhoven, and Snow, 1995) explore the validity and usefulness of the mathematics and science tests.

[8] Following the NELS:88 codebook (U.S. Department of Education, 1990), we used the following values for DEFF: For analyses of 10th grade student data, DEFF=2.668; for analyses of 8th and 10th grade student data, DEFF=2.619; for analyses of 10th and 12th grade student data, DEFF=2.532; and for analyses of 8th, 10th, and 12th grade student data, DEFF=2.532.

[9] The standard errors in all tables describing student characteristics are adjusted for design effects. If the reader wishes to examine unadjusted standard errors, they should divide the reported standard errors by the square root of DEFF.

[10] This SEI score is a composite of parents' education, parents' occupations, and family income, and is standardized across the entire NELS:88 sample in such a way that its mean is zero and its standard deviation is one.

[11] It makes no sense to report this figure for students in grade 8 *and* grade 10 because of the construction of the analysis sample. Since students must have been in-grade and in-school in grade 10, retention could only have occurred *before* grade 8.

[12] Again, the standard errors in all tables reporting outcome measures have been adjusted for design effects. If the reader wishes to examine unadjusted standard errors, they should divide the reported standard errors by the square root of DEFF.

[13] Note that, unlike BL&H, for our regression results we make use of standard errors which are *not* adjusted for design effects. The numbers in parentheses in Tables 6 and 7 are absolute values of ratios of unstandardized coefficients to standard errors. Since it is generally accepted that design effects are less consequential for more complex statistics, we feel that this is justified. However, we acknowledge that our measures of statistical significance are fairly liberal; that is, they are somewhat biased *toward* finding significant effects of single-sex school attendance.

[14] For example, see edited volumes by Gabriel and Smithson (1990) and Lasser (1987).

[15] As Lee and her colleagues (Lee, Marks, and Byrd, 1994) have shown in an observational study of 86 classrooms in 21 independent secondary schools, the *frequency* of sexist incidents occurring in single-sex boys', coeducational, and single-sex girls' schools is similar across all school types. However, the *form* that sexism takes and the *severity* of these incidents may differ between school sectors.

Table 1.
Sample Selection Criteria and Sample Sizes by High School Sector and Sex

	Male Students		Female Students	
	Sing.-Sex	Coed	Sing.-Sex	Coed
Unweighted Data				
Sample for Analyses of 10th Grade Student Outcomes Restricted to Students Who ...				
... attended Catholic Single-Sex or Coeducational Secondary Schools in 1990,	186	238	127	285
... AND did not attend a Catholic School in Which more than 25 Percent of Students were in the Vocational Track,	186	223	109	263
... AND were Attending School and In-Grade in 1990.	185	223	109	263
Sample for Analyses of 12th Grade Student Outcomes Further Restricted to Students Who ...				
... Participated in all Three NELS:88 Survey Waves,	178	217	107	254
... AND did not Drop Out of School Between 1990 and 1992 (Students' Sophomore and Senior Years of School),	177	215	105	251
... AND did not Change Schools Between 1990 and 1992 (Students' Sophomore and Senior Years of School).	157	190	85	227
Weighted Data				
Samples for Analyses of 10th Grade Student Outcomes				
... Using Only 10th Grade Data (Weight: F1QWT)	92	69	57	84
... Using 8th and 10th Grade Data (Weight: F1PNLWT)	105	79	65	96
Samples for Analyses of 12th Grade Student Outcomes				
... Using 10th and 12th Grade Data (Weight: F2F1PNWT)	85	57	48	79
... Using 8th, 10th, and 12th Grade Data (Weight: F2PNLWT)	95	64	53	87

Table 2.
Characteristics of Students in Grade 8 by High School Sector and Sex

	Source Variables(s)	Male Students		Female Students	
		Sing.-Sex	Coed	Sing.-Sex	Coed
Socioeconomic Circumstances in Grade 8					
SES Composite	BYSES	0.40	0.33	0.34	0.24
		(0.06)	(0.08)	(0.09)	(0.06)
Number of Siblings	BYS32	1.94	2.26	1.99	2.09
		(0.13)	(0.19)	(0.18)	(0.14)
Proportion of Households w/ 2 Parents	BYPARMAR	0.88	0.88	0.90	0.89
		(0.03)	(0.04)	(0.04)	(0.03)
Race/Ethnicity (Proportion White)	BYS31A	0.70	0.72	0.79	0.72
		(0.04)	(0.05)	(0.05)	(0.05)
Educational Aspirations in Grade 8					
Proportion Who Think They Will Finish College	BYS45	0.91	0.77	0.83	0.92
		(0.03)	(0.05)	(0.05)	(0.03)
Proportion Who Are Very Sure They Will Graduate From High School	BYS46	0.89	0.83	0.88	0.89
		(0.03)	(0.04)	(0.04)	(0.03)
Proportion Who Are Very Sure They Will Go on Farther Than High School	BYS47	0.83	0.68	0.79	0.82
		(0.04)	(0.05)	(0.05)	(0.04)
Maximum (Weighted) Sample Size		95	64	53	87

Sample: Sample restricted to individuals who 1) were in one of the two school sectors; 2) did not attend a Catholic school in 10th grade in which 25 percent of the students were in the vocational track; and 3) were in-school and in-grade during the sophomore-year follow-up.

Weighting: Sample weighted so that standard errors are based on actual sample sizes and are adjusted for design effects. See text for details. Specifically:
NEW WEIGHT = (OLD WEIGHT/(Mean Value of OLD WEIGHT))/DEFF.

Note: Numbers in parentheses are design-effect adjusted standard errors.

Table 3.
Characteristics of Students in Grade 10 by High School Sector and Sex

	Source Variables(s)	Male Students		Female Students	
		Sing.-Sex	Coed	Sing.-Sex	Coed
Socioeconomic Circumstances in Grade 10					
SES Composite	F1SES	0.48	0.33	0.39	0.30
		(0.06)	(0.08)	(0.09)	(0.06)
Number of Siblings	F1S90A-91B	2.13	2.31	1.93	2.26
		(0.16)	(0.20)	(0.19)	(0.17)
Proportion of Households w/ 2 Parents	F1S92A-F	0.85	0.83	0.87	0.88
		(0.03)	(0.04)	(0.04)	(0.03)
Race/Ethnicity (Proportion White)	F1RACE	0.71	0.73	0.80	0.75
		(0.04)	(0.05)	(0.05)	(0.04)
Educational Aspirations in Grade 10					
Proportion Who Think They Will Finish College	F1S49	0.90	0.77	0.82	0.86
		(0.03)	(0.05)	(0.05)	(0.04)
Proportion Who Are Very Sure They Will Graduate From High School	F1S18A	0.91	0.91	0.93	0.91
		(0.03)	(0.03)	(0.03)	(0.03)
Proportion Who Are Very Sure They Will Go on Farther Than High School	F1S18B	0.84	0.70	0.83	0.82
		(0.04)	(0.05)	(0.05)	(0.04)
Grade Delay					
Proportion Who Have Ever Repeated a Grade	F1N22	0.06	0.19	0.04	0.02
		(0.02)	(0.04)	(0.03)	(0.02)
Maximum (Weighted) Sample Size		95	64	53	87

Notes: Numbers in parentheses are design-effect adjusted standard errors. See notes below Table 2 for descriptions of sample selection, weighting, and adjustments for design effects.

Table 4.
Achievement Test Scores by High School Sector and Sex

	Source Variables(s)	Male Students		Female Students	
		Sing.-Sex	Coed	Sing.-Sex	Coed
Achievement Test Scores: Grade 8					
Reading Test (IRT)	BY2XRIRR	30.62	28.29 •••	31.27	31.61
		(0.77)	(0.95)	(0.90)	(0.80)
Math Test (IRT)	BY2XMIRR	42.77	38.55 •••	38.08	39.82
		(0.99)	(1.24)	(1.37)	(1.03)
Science Test (IRT)	BY2XSIRR	21.18	19.63 •••	19.28	19.30
		(0.42)	(0.52)	(0.54)	(0.42)
Social Studies Test (IRT)	BY2XHIRR	32.31	31.06 ••	30.92	30.95
		(0.39)	(0.54)	(0.49)	(0.39)
Achievement Test Scores: Grade 10					
Reading Test (IRT)	F12XRIRR	34.73	32.45 ••	34.83	35.56
		(0.80)	(1.04)	(1.12)	(0.85)
Math Test (IRT)	F12XMIRR	51.67	47.76 •••	47.37	48.91
		(1.06)	(1.24)	(1.61)	(1.17)
Science Test (IRT)	F12XSIRR	24.20	22.79 ••	22.55	23.14
		(0.51)	(0.65)	(0.63)	(0.52)
Social Studies Test (IRT)	F12XHIRR	34.35	32.98 •••	33.16	32.94
		(0.38)	(0.51)	(0.53)	(0.42)
Achievement Test Scores: Grade 12					
Reading Test (IRT)	F22XRIRR	37.03	34.94 •	38.11	38.88
		(0.83)	(1.15)	(1.08)	(0.91)
Math Test (IRT)	F22XMIRR	57.01	53.92 ••	52.77	53.77
		(1.12)	(1.43)	(2.09)	(1.30)
Science Test (IRT)	F22XSIRR	26.41	25.34	23.52	24.82
		(0.60)	(0.70)	(0.85)	(0.56)
Social Studies Test (IRT)	F22XHIRR	38.12	37.22	36.32	36.92
		(0.48)	(0.58)	(0.73)	(0.53)
Gain Scores: Grade 8 to 12					
Reading Test (IRT)	F22XRIRR - F12XRIRR	6.41	6.65	6.84	7.27
		(1.13)	(1.49)	(1.41)	(1.21)
Math Test (IRT)	F22XMIRR - F12XMIRR	14.24	15.37	14.69	13.95
		(1.49)	(1.89)	(2.49)	(1.66)
Science Test (IRT)	F22XSIRR - F12XSIRR	5.23	5.71	4.23	5.52
		(0.73)	(0.87)	(1.01)	(0.70)
Social Studies Test (IRT)	F22XHIRR - F12XHIRR	5.81	6.16	5.40	5.97
		(0.62)	(0.79)	(0.87)	(0.66)
Maximum (Weighted) Sample Size		95	64	53	87

Notes: Numbers in parentheses are design-effect adjusted standard errors. See notes below Table 2 for descriptions of sample selection, weighting, and adjustments for design effects.

Sign. Tests: Tests compare scores for single-sex and coeducational school students, separately for boys and girls.
* = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$ (all two-tailed tests).

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Table 5.
Psychological Measures by High School Sector and Sex

	Source Variables(s)	Male Students		Female Students	
		Sing.-Sex	Coed	Sing.-Sex	Coed
Psychological Measures: Grade 8					
Locus of Control	BYLOCUS2	0.20	0.10	0.10	0.21
		(0.05)	(0.07)	(0.07)	(0.05)
Self-Esteem	BYCNCPT2	0.24	0.21	-0.07	-0.05
		(0.06)	(0.07)	(0.08)	(0.07)
Psychological Measures: Grade 10					
Locus of Control	F1LOCUS2	0.19	0.09	0.02	0.13
		(0.06)	(0.07)	(0.07)	(0.06)
Self-Esteem	F1CNCPT2	0.32	0.19 *	-0.13	-0.06
		(0.06)	(0.08)	(0.09)	(0.06)
Psychological Measures: Grade 12					
Locus of Control	F2LOCUS2	0.11	0.05	0.12	0.14
		(0.06)	(0.07)	(0.07)	(0.06)
Self-Esteem	F2CNCPT2	0.26	0.15	-0.08	-0.05
		(0.07)	(0.09)	(0.10)	(0.07)
Change in Psychological Measures, Grade 8 to Grade 12					
Locus of Control	F2LOCUS2 - F1LOCUS2	-0.09	-0.05	0.03	-0.07
		(0.08)	(0.10)	(0.10)	(0.08)
Self-Esteem	F2CNCPT2 - F1CNCPT2	0.02	-0.06	-0.01	-0.01
		(0.09)	(0.11)	(0.13)	(0.09)
Maximum (Weighted) Sample Size		95	64	53	87

Notes: Numbers in parentheses are design-effect adjusted standard errors. See notes below Table 2 for descriptions of sample selection, weighting, and adjustments for design effects.

Sign. Tests: Tests compare scores for single-sex and coeducational school students, separately for boys and girls.
* = p < 0.10; ** = p < 0.05; *** = p < 0.01 (all one-tailed tests)

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Table 6.
Regressions of 10th and 12th Grade Psychological and Achievement Test Scores on Students' 10th Grade Characteristics

	Boys						Girls					
	Reading	Math	Science	History	Locus	Esteem	Reading	Math	Science	History	Locus	Esteem
Regressions of 10th Grade Test Scores			N = 161						N = 141			
A. Single Sex School Dummy Variable	1.56	3.87	1.14	1.07	0.09	0.12	-0.31	-0.67	-0.45	0.52	-0.12	-0.08
	(1.73)	(3.40)	(1.98)	(2.43)	(1.32)	(1.73)	(0.34)	(0.52)	(0.83)	(1.16)	(1.94)	(1.13)
B. A + Family Background and Educational Aspirations as of Grade 10	0.84	2.53	1.00	0.88	0.07	0.12	-0.50	-1.25	-0.74	0.47	-0.15	-0.10
	(0.96)	(2.35)	(1.75)	(2.01)	(1.12)	(1.71)	(0.57)	(1.05)	(1.46)	(1.13)	(2.50)	(1.50)
Regressions of 12th Grade Test Scores			N = 142						N = 127			
C. Single Sex School Dummy Variable	2.12	2.85	1.11	0.41	0.12	0.14	0.05	0.53	-0.48	-0.01	-0.05	0.16
	(2.17)	(2.17)	(1.66)	(0.77)	(1.66)	(1.60)	(0.05)	(0.30)	(0.66)	(0.01)	(0.60)	(1.76)
D. C + Family Background and Educational Asprirations as of Grade 10	1.91	2.36	0.89	0.24	0.14	0.16	-0.69	-0.53	-0.72	-0.41	-0.05	0.15
	(2.05)	(1.96)	(1.37)	(0.46)	(1.85)	(1.72)	(0.66)	(0.33)	(1.04)	(0.67)	(0.66)	(1.53)
E. D + Achievement and Psychological Test Scores in Grade 10	0.44	0.21	-0.04	-0.41	0.05	0.02	-0.02	0.14	-0.25	-0.34	0.04	0.18
	(0.65)	(0.30)	(0.09)	(1.01)	(0.73)	(0.30)	(0.03)	(0.19)	(0.51)	(0.85)	(0.50)	(2.19)
Regressions of 10th-12th Grade Gains			N = 142						N = 127			
F. Single Sex School Dummy Variable	0.28	0.10	0.01	-0.33	-0.03	-0.09	0.40	-0.45	0.07	-0.68	0.04	0.17
	(0.38)	(0.15)	(0.03)	(0.71)	(0.43)	(1.08)	(0.60)	(0.64)	(0.13)	(1.71)	(0.48)	(1.89)
G. F + Family Background and Educational Asprirations as of Grade 10	0.60	0.07	-0.09	-0.43	-0.01	-0.06	0.42	-0.29	0.30	-0.68	0.08	0.17
	(0.79)	(0.10)	(0.17)	(0.90)	(0.17)	(0.69)	(0.61)	(0.41)	(0.56)	(1.68)	(0.96)	(1.91)
H. G + Achievement and Psychological Test Scores in Grade 10	0.44	0.21	-0.04	-0.41	0.05	0.02	-0.02	0.14	-0.25	-0.34	0.04	0.18
	(0.65)	(0.30)	(0.09)	(1.01)	(0.73)	(0.30)	(0.03)	(0.19)	(0.51)	(0.85)	(0.50)	(2.19)

Notes: Sample for analyses of 10th grade outcomes restricted to individuals who 1) were in one of the two school sectors; 2) did not attend a Catholic school in 10th grade in which 25 percent of the students were in the vocational track; and 4) Were in-school and in-grade as of the sophomore year follow-up. Sample for 12th grade outcomes further restricted to individuals who 4) participated in all three survey waves; 5) did not drop-out of school between grades 10 and 12; and 6) did not change schools between grades 10 and 12. All analyses are then restricted to cases with no missing data on any of the dependent or independent variables. Samples weighted so that standard errors are based on actual sample sizes. Note that numbers in parentheses are the absolute values of the ratios of unstandardized coefficients to standard errors which are not adjusted for design effects.

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Table 7.
Regressions of 10th and 12th Grade Psychological and Achievement Test Scores on Students' 8th and 10th Grade Characteristics

	Boys						Girls					
	Reading	Math	Science	History	Locus	Esteem	Reading	Math	Science	History	Locus	Esteem
Regressio	*10th Grade Test Scores*		N = 184						N = 161			
A. Single	chool Dummy Variable	0.63	3.69	1.19	0.76	0.09	0.15	-0.10	-0.07	-0.10	0.67	-0.14	-0.09
		(0.68)	(3.15)	(2.05)	(1.75)	(1.36)	(2.08)	(0.11)	(0.06)	(0.19)	(1.51)	(2.24)	(1.33)
B. A + Fa	Background and Educational	-0.50	2.61	0.78	0.41	0.03	0.10	-0.24	-1.17	-0.48	0.51	-0.14	-0.06
Asprir	as of Grade 8	(0.55)	(2.33)	(1.31)	(0.93)	(0.39)	(1.33)	(0.26)	(0.96)	(0.92)	(1.19)	(2.15)	(0.83)
C. B + Ac	ement and Psychological	-1.38	0.78	0.12	0.09	-0.00	0.10	-0.31	0.22	-0.33	0.50	-0.09	-0.03
Test S	in Grade 8	(2.19)	(1.12)	(0.28)	(0.28)	(0.06)	(1.52)	(0.51)	(0.37)	(0.86)	(1.66)	(1.57)	(0.57)
Regressio	*12th Grade Test Scores*		N = 159						N = 140			
D. Single	School Dummy Variable	0.51	2.06	0.98	0.05	0.10	0.21	0.39	1.90	0.08	0.36	-0.05	0.16
		(0.53)	(1.48)	(1.43)	(0.10)	(1.28)	(2.23)	(0.34)	(1.06)	(0.11)	(0.54)	(0.68)	(1.70)
E. D + Fa	Background and Educational	0.57	2.08	0.82	-0.21	0.09	0.18	-0.74	0.81	-0.25	-0.02	-0.02	0.16
Asprir	as of Grade 8	(0.59)	(1.61)	(1.23)	(0.39)	(1.11)	(1.89)	(0.66)	(0.47)	(0.34)	(0.03)	(0.31)	(1.70)
F. E + Ac	vement and Psychological	-0.01	1.22	0.40	-0.27	0.09	0.17	-0.81	-0.16	-0.79	-0.27	-0.05	0.10
Test Sc	s in Grade 8	(0.01)	(1.29)	(0.77)	(0.68)	(1.15)	(1.94)	(0.97)	(0.16)	(1.55)	(0.54)	(0.70)	(1.13)
G. F + Ed	tional Aspriations as of	0.14	1.35	0.42	-0.26	0.11	0.18	-0.89	-0.31	-0.74	-0.38	-0.07	0.11
Grade		(0.19)	(1.42)	(0.81)	(0.67)	(1.30)	(1.99)	(1.03)	(0.30)	(1.42)	(0.74)	(0.83)	(1.18)
H. G + Ac	vement and Psychological	-0.27	0.25	0.14	-0.17	0.04	0.09	-0.73	-0.00	-0.35	-0.50	0.03	0.14
Test Sc	s in Grade 10	(0.39)	(0.33)	(0.28)	(0.44)	(0.51)	(0.99)	(1.03)	(0.00)	(0.69)	(1.18)	(0.38)	(1.66)

Notes: Sam for analyses of 10th grade outcomes restricted to individuals who 1) were in one of the two school sectors; 2) did not attend a Catholic school in 10th gra in which 25 percent of the students were in the vocational track; and 4) Were in-school and in-grade as of the sophomore year follow-up. Sample for 12th gr outcomes further restricted to individuals who 4) participated in all three survey waves; 5) did not drop-out of school between grades 10 and 12; and 6) did n change schools between grades 10 and 12. All analyses are then restricted to cases with no missing data on any of the dependent or independent variables. Samples weighted so that standard errors are based on actual sample sizes. Note that numbers in parentheses are the absolute values of the ratios of unstandardized coefficients to standard errors which are not adjusted for design effects.

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